

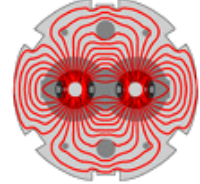
# Beam based modelling

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**Ghislain Roy**  
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# GUI based on beta beating app.

Jaime Coello de Portugal



- ◆ The steering panel
- ◆ Commands can be passed to MADX manually using the input window at the bottom

File

output\_20120826084 model\_1

Filter

Magnet type: None

Sector: None

Beam: None

Variable name	Element name	Value
kof.a23b1		0.0
ksf2.a78b2		0.06620002
kof.a23b2		0.0
kss.a56b1		0.0
kco.a23b1		0.0
ksd2.a45b2		-0.10783985
kss.a56b2		0.0
kco.a23b2		0.0
ksd2.a45b1		-0.10716428
ksf2.a78b1		0.065659
kcox3.r8		0.0
kcs.a78b1		0.0
kcs.a78b2		0.0
kod.a34b1		0.0
kod.a34b2		0.0
ksf1.a45b1		0.065659
ksf1.a45b2		0.06620002
kof.a78b2		0.0
kof.a56b2		0.0
kof.a78b1		0.0
kof.a56b1		0.0
ksf2.a45b1		0.065659
kcs.a56b1		0.0
kcs.a56b2		0.0
ksf2.a45b2		0.06620002
ksd1.a45b2		-0.10783985
ksd1.a45b1		-0.10716428
kcox3.r5		0.0
ksd2.a56b1		-0.10716428
kss.a78b1		0.0
kcox3.r2		0.0
ksd2.a56b2		-0.10783985
kss.a78b2		0.0
kss.a12b1		0.0
kss.a12b2		0.0

Selected modifiers: Orbit

Run Twiss and show

Open view

kof.a81b2 = 0 ;

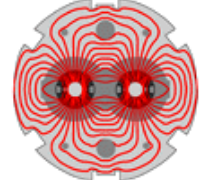
V





# GUI / Predictor tool

Jaime Coello de Portugal

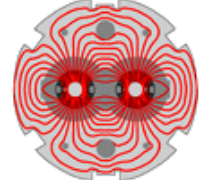


- ◆ Adding additional effects
  - Simulate a knob action
    - ◆ Find a knob

The screenshot shows the 'Knob extractor' tool interface. The main window displays a list of variables and elements. A sub-window titled 'AdditionalEffects' shows 'Knob' selected. A table of extracted knobs is shown, along with a bar chart of their values.

Madx name	Element name	Value
acbxh3.r5	RCBXH3.R5	0.0
acbc5.r5b1	RCBC5.R5B1	4.61359E-8
acbxh1.r5	RCBXH1.R5	-2.0588236E-7
acbyh5.r5b2	RCBYH5.R5B2	-1.5865218E-7
acbc6.r5b2	RCBC6.R5B2	-8.8922974E-8
acbyh4.l5b1	RCBYH4.L5B1	-1.5339211E-7
acbc5.l5b2	RCBC5.L5B2	5.2187886E-8
acbyh4.l5b2	RCBYH4.L5B2	2.7229675E-7
acbc6.l5b1	RCBC6.L5B1	-9.440646E-8
acbxh2.r5	RCBXH2.R5	0.0
acbxh1.l5	RCBXH1.L5	2.0588236E-7
acbxh2.l5	RCBXH2.L5	0.0
acbyh5.r5b1	RCBYH5.R5B1	2.814602E-7
acbxh3.l5	RCBXH3.L5	0.0

The bar chart shows the values of the extracted knobs, ranging from approximately -2E-7 to 3E-7. The x-axis represents the knob index (0 to 12), and the y-axis represents the value.

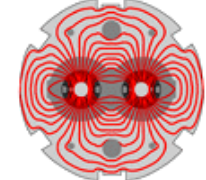


- ◆ Adding additional effects
  - Simulate a knob action
    - ◆ Here, effect of a beta beating correction knob



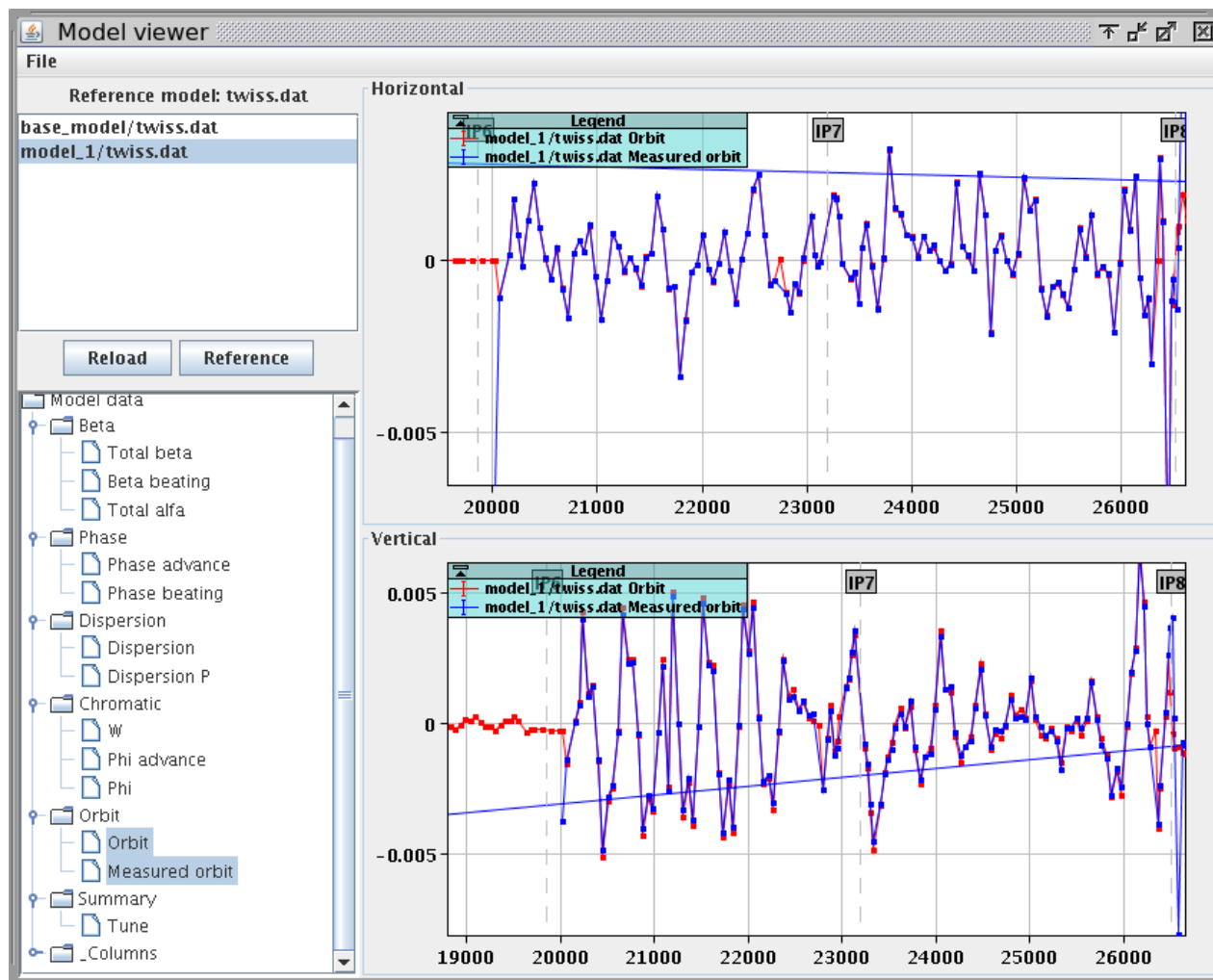
# Sector tests: the first experience

## Polarity measurements



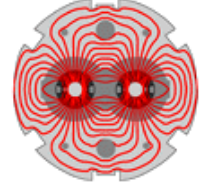
- ◆ GUI and Orbit modeling
  - The integrated orbit modelling tool

Display of the extracted and the modelled orbit



# Sector tests: the first experience

## Polarity measurements

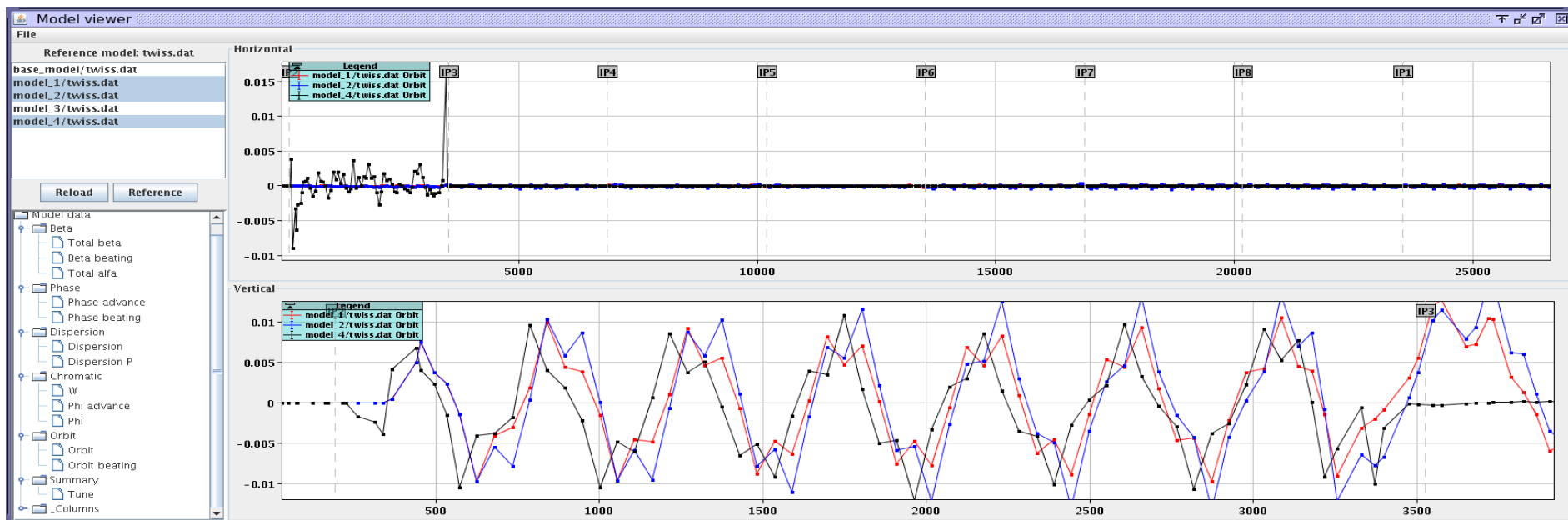


### ◆ kqtl11.r2b1

- Red: model orbit response to kick with correct polarity
- Blue: the same with reversed polarity
- Black: measured orbit

### ◆ Conclusion: black closer to red, polarity is good

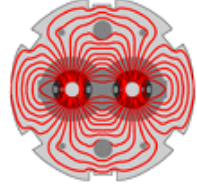
- minus the offset in s





# Sector tests: the first experience

## Lessons learnt

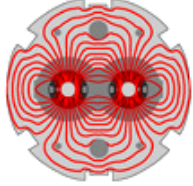


- ◆ The tools showed to be useful
- ◆ The GUI needs to be made more intuitive
- ◆ Better annotation of the data (beam No, date, effects included)
- ◆ Easier comparison with the measurements
- ◆ Additional tool for plot manipulations would be off hand
  - For example, for polarity checks we needed to compare difference of orbits between 2 models (no problem, this is in) with difference between 2 measured orbits





# Future steps

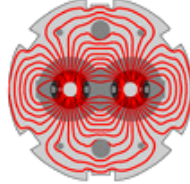


- ◆ Extraction of the measured phase advances (beta beating)
- ◆ Reproduce the measured beta function in order to create an effective model.
- ◆ Enable a direct reading of the orbit from the GUI.
- ◆ Load old models from the GUI.
- ◆ Misalignments and Magnetic Errors
  - Currently implemented in WISE
  - Data extraction currently not automatic
  - Had the first meeting with Per: understand the WISE implementation



# Web page

# http://lhcmmodel.web.cern.ch



**BEAM BASED MODEL**

**Short description of the Extractor software**

**Optics and orbit**

The optics extractor is an application that retrieves the active optics and beam orbit at the moment or was setup at a user selected moment. For example,

```
/afs/cern.ch/eng/lhc_online_model/pro/bin/lhc-model-extractor.sh -e "2012-08-24 09:00:00" B1
```

outputs files `job.LHCB1.twiss.madx` and `LHCB1.orbit.tfs`.

`job.LHCB1.twiss.madx` executed with MADX will produce 2 files with Twiss tables: `twiss_elements.dat` with complete table and `twiss.dat` with rows corresponding only to BPMs.

This MADX script is created from a template, see `MadxTemplateExample` file that you find in your directory after running the example. This template can be specified by the user via [configuration file](#) if any customization is needed. This template must contain call to `modifiers.madx`

Argument B1 or B2 is obligatory for the extractor. If B2 is used the output file names are changed accordingly.

**Circuits**

The same application can also extract strengths of particular circuits. In the example below the circuits in the pre-defined lists CORR and MQT are extracted, which correspond to orbit correctors and MQT magnets, respectively.

**Links**

- LHC
- Old LHC page LHC Page 1
- BE/ABP/LAT section
- BE/ABP/HSS section
- LHC Optics page
- New (preliminary)

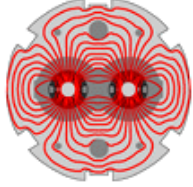
**Related pages**

OMC

The Java API for Ma



# Beam Process Scanner



- ◆ It is an OP application for verification of the optics in LSA and the interpolations between matched points
- ◆ The application can be launched with  
<http://abwww/ap/pro/accsoft/om/accsoft-om-app-bpscan/PRO/om-bpscan.jnlp>